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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/305,240	05/04/99	SHIM	B 5484-48

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EXAMINER	
NADAV,O	
ART UNIT	PAPER NUMBER
2811	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/305,240	Applicant(s) Shim et al.
	Examiner ORI NADAV	Group Art Unit 2811

☒ Responsive to communication(s) filed on *Feb 27, 2001*.

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *3* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) *1-7 and 9* is/are pending in the application.

Of the above, claim(s) *1-4* is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *5-7 and 9* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐approved ☐disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____.

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 5-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacDougall et al. (3,895,966) in view of Admitted Prior Art (APA).

MacDougall et al. teach in figure 1 a transistor for use as a pull up transistor with a Vdd terminal and an I/O pad of a semiconductor device comprising: a semiconductor substrate 10 of a first conductivity type, source and drain regions 11, 12 of a second conductivity type formed in the substrate and defining a channel region therebetween, an impurity implantation region of impurities of a second conductivity type in a first sector of the channel region (column 2, lines 60-65), the first sector does not reach either one of the source and drain regions and is separated therefrom by equal distances, wherein the channel region exclusive of the first sector has a uniform doping concentration of the first conductivity type, a gate insulating layer 15 on the substrate and over at least a portion of the impurity implantation region and over at least a portion of an area adjacent the impurity implantation region, and a gate 14 on the gate

insulating layer over at least a portion of the first sector and of a region adjacent to the first sector, wherein the first sector has a narrower line width than a line width of the gate and the first portion is in a predetermined ratio with the area adjacent to the first portion.

Although MacDougall et al. do not explicitly state that the first sector does not reach either one of the source and drain regions and has a narrower line width than a line width of the gate, it is clear from figure 1 that the first sector does not reach either one of the source and drain regions and the right side of the first sector is horizontally shorter than the length of the gate.

MacDougall et al. do not teach using the transistor as a pull up transistor in which one of the source and drain regions being coupled with the I/O pad and the other one being coupled with the Vdd terminal.

APA teaches in figure 1 a pull up transistor, wherein one of the source and drain regions being coupled with the I/O pad and the other one being coupled with the Vdd terminal.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use MacDougall's transistor as a pull up transistor, in which one of the source and drain regions being coupled with the I/O pad and the other one being coupled with the Vdd terminal, because it is conventional to connect one of the source and drain regions being coupled with the I/O pad and the other one being coupled with

the Vdd terminal in a pull up transistor in order to operate the transistor in its intended use as an enhancement mode transistor.

Furthermore, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

Regarding claim 9, figure 1 of MacDougall et al. clearly depicts the first sector is separated from the source and drain regions by substantially equal distances.

Response to Arguments

3. Applicant argues on page that prior art does not teach the novel feature of an impurity implantation region of impurities of a second conductivity type in a first sector of the channel region, the first sector does not reach either one of the source and drain regions and is separated therefrom by equal distances, wherein the channel region exclusive of the first sector has a uniform doping concentration of the first conductivity type.

However, applicant does not specify which of the elements in the novel feature prior art does not.

4. Applicant argues on page 3 that MacDougall et al. do not teach a channel region exclusive of the first sector, because MacDougall et al. implant impurities into a channel region extending from the source region to the drain region, not just a portion of the channel region, as recited in column 2, lines 5-29 and lines 58-59).

MacDougall et al. teach in column 2, lines 5-29 introducing dopants into the gate and the channel region between the source and drain regions. MacDougall et al. further teach in column 2, lines 58-59, that the conduction of electrons from the source to the drain regions would be in the channel region. None of the above recitations call for implanting impurities into a channel region extending from the source region to the drain region, not just a portion of the channel region, as argued by applicant. Introducing dopants into the gate and the channel region between the source and drain regions does not mean that the dopants are introduced in the whole channel region and are in contact with the source and drain regions. Furthermore, stating that the conduction of electrons from the source to the drain regions would be in the channel region does not relate to implanting boron impurities into the channel region.

5. Applicant argues on page 3 that the methods described by MacDougall et al. in column 2, lines 10-17 and column 6, lines 2-10, of implanting dopants into the channel region by exposing the unmasked gate insulator, mean that the dopants are introduced into the whole channel region.

MacDougall et al. teach in columns 2 and 6 introducing dopants into the gate and the channel region between the source and drain regions. There is no description of introducing dopants into the gate and the whole channel region. In fact, implanting dopants into the gate and the channel region in one step means that MacDougall et al. teach away from introducing dopants into the whole channel region. Figure 1 depicts gate 14 having a width substantially equal to that of layer 6, whereas portions of the gate insulating layer 15 overlap portions of the source/drain regions. If dopants were introduced over the whole width of the gate insulator, then some boron implantation would occur in the source/drain regions. MacDougall et al. do not disclose further implanting the source/drain regions. Therefore, for dopants to be introduced only into the whole channel region, as argued by applicant, a special mask covering part of the gate insulator would have to be used. MacDougall et al. does not teach using a special mask covering part of the gate insulator. Thus, it is clear that the dopants are introduced into the gate and into layer 6 of the channel region located underneath the gate, as illustrated in figure 1, and not in other portions of the channel region.

6. Applicant argues on page 4 that although layer 6 depicts only a portion of the channel, it has no significance or meaning, because MacDougall et al.'s channel extends all the way between the source and the drain regions.

Figure 1 depicts the width of channel 6 is substantially identical to that of the gate. MacDougall et al. teach simultaneously introducing dopants into the gate and the channel region. Therefore, although applicant did not find any reason for layer 6 to extend along only a portion of the channel region, it is clear that layer 6 depicts the extent of the boron dopants in the channel region.

7. Applicant argues on page 4 that Introducing dopants into the gate and the channel region of MacDougall means introducing dopants in the whole channel region, because the threshold voltage would not be precisely controlled if the channel region is exclusive of the first sector. Applicant further argues that the examiner acknowledges that MacDougall teaches conduction of electrons from the source to the drain region. and are in contact with the source and drain regions.

MacDougall et al. introduce boron dopants into the channel region in order to lower the threshold voltage (column 2, lines 20-22). The threshold voltage can increase if the channel region is exclusive of the first sector. Furthermore, stating that the conduction of electrons from the source to the drain regions would be in the channel region does not relate to implanting boron impurities into the channel region.

8. Applicant argues on page 5 that the examiner's statement regarding introducing dopants over the whole width of the gate insulator is confusing as to its importance, because the concentration of the channel region (E17 to E18 ion/cm3) with respect to that of the drain/source regions (more than E20 ions/cm3) is negligible.

Applicant's argument is based on the hypothesis that the doping concentration of the channel region is between E17 and E18 ion/cm3, and the doping concentration of the drain/source regions is more than E20 ions/cm3. MacDougall does not teach these ranges of doping concentrations. Moreover, if applicant argument had been correct and the whole channel region was doped together with re-doping the source/drain regions, then the substrate beyond the source/drain regions would have also been doped. However, MacDOugall does not teach, neither re-doping the source/drain regions, nor doping the substrate area beyond the source/drain regions. Thus, it is clear that MacDougall does not introduce dopants over the whole channel region.

Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG

30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 and 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to *Examiner Nadav* whose telephone number is **(703) 308-8138**. The Examiner is in the Office generally between the hours of 7 AM to 3 PM (Eastern Standard Time) Monday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **308-0956**

Ori Nadav, Ph.D.

March 9, 2001

William Mintel

William Mintel
Primary Examiner
Art Unit 2811